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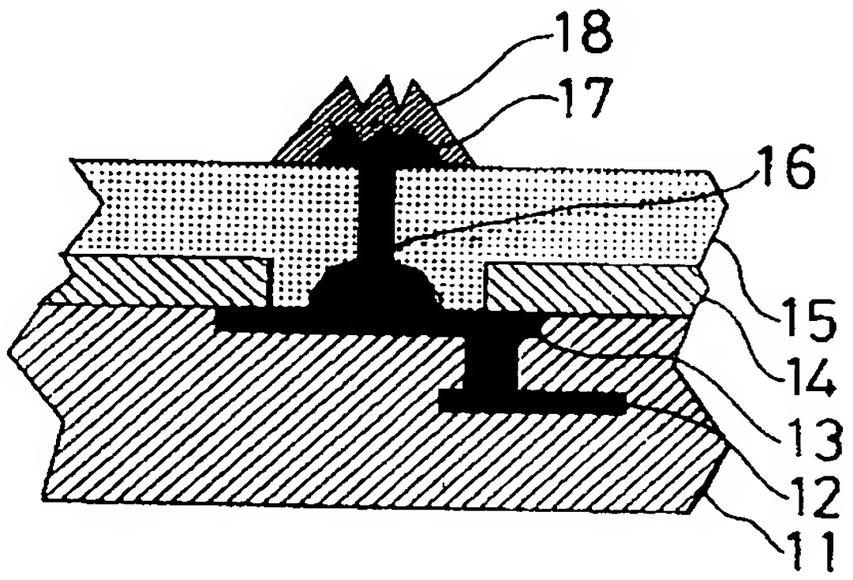
(54)【発明の名称】　コンタクタ及びコンタクタの形成方法

(57)【要約】

【課題】　ウエハ状態でのバーンインを行なうための繰り返し使用できる安価なコンタクタ及びコンタクタの形成方法を提供する。

【解決手段】　シリコンウエハに近い熱膨張係数を有する絶縁基板１１上に配線された信号線や電源線１２の引出しパッド１３上に、スタッドバンプ１６を形成する。このスタッドバンプは、被検査ウエハー表面の凹凸および反り等の高さばらつきを吸収できるだけの高さの金属細線を有する。被検査ウエハに検査のために押し当てた後に、金属細線を元の高さに戻すための緩衝材としての有機絶縁膜１５を金属細線の先端が露出する高さまで塗布する。次にこの半完成状態のコンタクタを金属細線より機械的硬度の高い平板に押し当てる。この時、平板表面に被検査ウエハの電極材料の膜厚程度の凹凸をつけておくことにより、被検査ウエハの電極材料表面にある自然酸化膜を突き破りやすくする。



【特許請求の範囲】

【請求項１】　積層された配線構造を有する絶縁体基板上に前記配線に電気的接続して設けた外部引き出し用電極に、金属細線を用いたワイアーボンディングにより、前記金属細線の先端部分を残した状態でスタッドバンプを形成し、前記金属細線の先端部分が露出するように前記スタッドバンプを有機絶縁材料薄膜で被覆し、前記有機絶縁材料薄膜から突出した部分の金属細線を機械的に押しつぶし、その部分を機械的硬度の高い導電材料で被覆して構成したコンタクタ。

【請求項２】　積層された配線構造を有する絶縁体基板上に前記配線に電気的接続して設けた外部引き出し用電極に、金属細線を用いたワイアーボンディングにより、前記金属細線の先端部分を残した状態でスタッドバンプを形成し、前記金属細線の先端部分が露出するように前記スタッドバンプを有機絶縁材料薄膜で被覆し、前記有機絶縁材料薄膜から突出した部分の金属細線を機械的に押しつぶし、その部分を機械的硬度の高い導電材料で被覆するコンタクタの形成方法。

【請求項３】　外部引き出し用電極にスタッドバンプを形成するに際し、残した金属細線の先端部分を、被試験半導体装置表面の凹凸を吸収出来る程度の長さとする請求項２に記載のコンタクタの形成方法。

【請求項４】　外部引き出し用電極にスタッドバンプを形成する際に残した金属細線の先端部分の一部を、有機絶縁材料で被覆する請求項３に記載のコンタクタの形成方法。

【請求項５】　外部引き出し用電極にスタッドバンプを形成する際に残した金属細線の有機絶縁材料による被覆部分より突出した先端部を、水平な面を持つ平板に押し当てて偏平に加工する請求項４に記載のコンタクタの形成方法。

【請求項６】　金属細線の先端部を押さえる際に、粗面に加工された平板に押し当てて、偏平加工部分の表面を粗面化する請求項５に記載のコンタクタの形成方法。

【請求項７】　偏平加工部分の表面を、機械的硬度の高い導電材料により被覆する請求項５に記載のコンタクタの形成方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ウェハ上の複数の半導体集積回路チップを一括して検査するためのコンタクタ及びコンタクタの形成方法に関するものである。

【０００２】

【従来の技術】近年、半導体集積回路装置（以下、半導体装置と称する。）を搭載した電子機器における小型化の進歩は目ざましく、又低価格化も進んでいる。これに伴って、半導体装置に対しても小型化と低価格化の要求が強くなっている。

【０００３】通常、半導体装置は、半導体ウェハ上に形成された複数の半導体装置チップを１つづつに切り出して、各半導体装置チップを、それぞれリードフレームのダイパッドに接着した後、ボンディングワイヤによりリードフレームと電気的に接続し、その後、半導体装置チップ及びリードフレームを樹脂またはセラミックスにより封止した状態で供給され、プリント基板に実装される。

【０００４】ところが、最近では、樹脂やセラミックスなどの封止材料は電気回路特性に直接作用する物ではなく、さらに電子機器の小型化および軽量化を図るために、その電子機器に搭載する半導体装置として、半導体ウェハから切り出したままで封止されていない状態の半導体装置チップの形態で、回路基板に直接実装する方法が開発されており、このようにして実装される半導体装置チップにおいては、その品質が充分保証されている事が必要条件である。

【０００５】このように、半導体装置チップの品質を保証するため、半導体ウェハから切り出した状態の各半導体装置チップをチップ用ソケットを用いて信頼性保証用通電基板に実装し、その状態でバーンイン試験をする方法があるが、この方法では、チップ用ソケットが高価でまた半導体装置チップの取扱が煩雑であり時間が多くかかる。このため、複数の半導体装置チップをそのウェハ状態で一括してバーンイン試験をする方法が開発されている。

【０００６】複数の半導体装置チップをウェハ状態で一括してバーンイン試験等の検査を実施するには、一枚の半導体ウェハ上に形成された複数の半導体装置チップの全てに対して、プローブ針を立てて電気的な接続をとり、同時に、電源電圧や信号を印加して動作させる必要がある。このため、非常に多くのプローブ針を持つプローブカードが必要になり、価格も高価なものになってしまう。

【０００７】そこで、フレキシブル基板にバンプが設けられた薄膜型のプローブカードよりなるコンタクタが提案されている（日東技法第２８巻第２号（１９９０年１０月）の第５７頁～６２頁参照）。

【０００８】このようなコンタクタを用いたバーンイン試験について以下に説明する。図７は従来のコンタクタを用いたプロービングの状態を示す断面図である。図７において、７１はカード型のコンタクタであって、ポリイミド基板７２と、ポリイミド基板７２上に形成された配線層７３及びプローブ端子としてのバンプ電極７４と、配線層７３とバンプ電極７４間を接続するスルーホール配線７５とを有している。

【０００９】図７に示すように、コンタクタ７１を被測定基板である半導体ウェハ７６に押しつけて、半導体ウェハ７６上の検査用電極としてのパッド電極７７とコンタクタ７１のバンプ電極７４とを圧着して電気的に接続する。この状態で電源電圧や信号を配線層７３を介して

バンプ電極７４に印加することにより、半導体ウェハ７６上の半導体装置チップの検査が可能となる。

【００１０】

【発明が解決しようとする課題】しかしながら上記のような従来のコンタクタでは、そのコンタクタを半導体ウエハに圧接して接続した際に、半導体ウエハ表面が完全に平坦でないために、コンタクタを構成するポリイミド基板を変形させるまで強く押し当てないと、ウエハ上の半導体装置全ての電極に確実にプロービングすることができず、このようなコンタクタは、速く劣化し長期間にわたって繰り返して使用することができないという問題点を有していた。

【００１１】また、このようなポリイミド基板を用いたコンタクタではコスト的にも高価となり、半導体装置の検査費用などを含めた生産コストをアップし、それらを搭載した電子機器の価格上昇にも繋がるという問題点も有していた。

【００１２】本発明は、上記従来の問題点を解決するもので、安価に形成することができ、半導体装置の検査費用などを含めた生産コストを低下することができるとともに、繰り返して使用することができるコンタクタ及びコンタクタの形成方法を提供する。

【００１３】

【課題を解決するための手段】上記の課題を解決するために本発明のコンタクタ及びコンタクタの形成方法は、半導体産業において非常に実績の高いワイアーボンディング技術を利用したスタッドバンプの使用を可能にするとともに、スタッドバンプの金属細線部分の機械的強度を高めつつ、半導体ウエハ表面の凹凸等による高さのばらつきを、有機塗布材料の柔軟性によって吸収することを特徴とする。

【００１４】以上により、コンタクタを安価に形成することができ、半導体装置の検査費用などを含めた生産コストを低下することができるとともに、コンタクタを繰り返して使用することができる。

【００１５】

【発明の実施の形態】本発明の請求項１に記載のコンタクタは、積層された配線構造を有する絶縁体基板上に前記配線に電気的接続して設けた外部引き出し用電極に、金属細線を用いたワイアーボンディングにより、前記金属細線の先端部分を残した状態でスタッドバンプを形成し、前記金属細線の先端部分が露出するように前記スタッドバンプを有機絶縁材料薄膜で被覆し、前記有機絶縁材料薄膜から突出した部分の金属細線を機械的に押しつぶし、その部分を機械的硬度の高い導電材料で被覆して構成する。

【００１６】請求項２に記載のコンタクタの形成方法は、積層された配線構造を有する絶縁体基板上に前記配線に電気的接続して設けた外部引き出し用電極に、金属細線を用いたワイアーボンディングにより、前記金属細線の先端部分を残した状態でスタッドバンプを形成し、前記金属細線の先端部分が露出するように前記スタッドバンプを有機絶縁材料薄膜で被覆し、前記有機絶縁材料薄膜から突出した部分の金属細線を機械的に押しつぶし、その部分を機械的硬度の高い導電材料で被覆する方法とする。

【００１７】これらの構成または方法によると、金属細線は、半導体ウエハ表面の凹凸および反り等の高さばらつきが十分に吸収できるだけの高さを持つことによって、半導体ウエハの高さばらつきを吸収し、金属細線を被覆する有機絶縁材料は、試験終了後にたわんで変形した金属細線を弾性によって復元させ、さらに金属細線の先端を粗面に変形した上で機械的硬度の高い導電材料で被覆することによって、繰り返し安定した電気的接続を可能とする。

【００１８】請求項３に記載のコンタクタの形成方法は、請求項２に記載のコンタクタの形成方法において、外部引き出し用電極にスタッドバンプを形成するに際し、残した金属細線の先端部分を、被試験半導体装置表面の凹凸を吸収出来る程度の長さとする方法とする。

【００１９】この方法によると、被試験半導体装置とコンタクタの距離が近いときには、たわむことによって、被試験半導体電極との距離が遠いコンタクタが確実に接続されるまで、コンタクタを被試験半導体装置に押し当てて、被試験半導体装置表面の凹凸あるいは装置の反りによるコンタクト時の電気的接続を確実にする。

【００２０】請求項４に記載のコンタクタの形成方法は、請求項３に記載のコンタクタの形成方法において、外部引き出し用電極にスタッドバンプを形成する際に残した金属細線の先端部分の一部を、有機絶縁材料で被覆する方法とする。

【００２１】この方法によると、コンタクタを半導体装置チップに押し当てた際に、強く当たる電極においては、局所的に有機塗布材料が弾性変形することにより、半導体装置チップをはずした際に元の厚さに戻る。

【００２２】請求項５に記載のコンタクタの形成方法は、請求項４に記載のコンタクタの形成方法において、外部引き出し用電極にスタッドバンプを形成する際に残した金属細線の有機絶縁材料による被覆部分より突出した先端部を、水平な面を持つ平板に押し当てて偏平に加工する方法とする。

【００２３】この方法によると、半導体装置チップに押し当てた際の接触面積を広く確保することにより、電気的接続をより確実にする。請求項６に記載のコンタクタの形成方法は、請求項５に記載のコンタクタの形成方法において、金属細線の先端部を押さえる際に、粗面に加工された平板に押し当てて、偏平加工部分の表面を粗面化する方法とする。

【００２４】この方法によると、接触面積を増やすと共に、半導体装置チップ電極の表面にある自然酸化膜を突

き破りやすくして、電気的接続をより確実にする。請求項７に記載のコンタクタの形成方法は、請求項５に記載のコンタクタの形成方法において、偏平加工部分の表面を、機械的硬度の高い導電材料により被覆する方法とする。

【００２５】この方法によると、コンタクタを半導体ウエハに押し当てた際のコンタクタ先端の変形を抑え、コンタクタを繰り返し使用できる状態に保持する。以下、本発明の実施の形態を示すコンタクタ及びコンタクタの形成方法について、図面を参照しながら具体的に説明する。

【００２６】図１は本実施の形態の形成方法により形成されたコンタクタの構造を示す断面図である。図１において、１１はコンタクタ外部と被試験体となる半導体装置に電気信号や電力を供給するための信号線や電源線が設置されている絶縁体基板、１２はコンタクタ外部と被試験となる半導体装置に電気信号や電力を供給するために設置されている信号線や電源線、１３は絶縁体基板１１上に設けた外部引き出し用電極、１４は絶縁体基板１１の表面を保護するための保護膜、１６は外部引き出し用電極１３上に形成されたいわゆるスタッドバンプ、１５はコンタクタを半導体ウエハに押し当てた際に半導体ウエハの凹凸等により引き起こされるスタッドバンプ１６の変形を吸収するための有機絶縁材料薄膜、１７は、スタッドバンプ１６から伸びた金属細線の有機絶縁材料薄膜１５より突出した部分を機械的もしくは熱的に偏平に加工し、その表面を粗面に仕上げたコンタクタの骨格、１８は金属細線から形成されたコンタクタの骨格１７に機械的に硬度の硬い導電材料で形成した電極である。

【００２７】以上のように構成されたコンタクタの形成方法について、図２から図６を参照しながら以下に説明する。図２において（第１工程）、絶縁体基板２１は例えば石英硝子の様なシリコンウエハの熱膨張係数（３．５×１０$^{-6}$／℃）に対して２５０％以下の範囲の熱膨張係数を有する材料が用いられる。これは、例えば１２５℃でバーンインを実施することを想定した場合に、８インチのシリコンウエハでは、約７０μｍの伸びが生じる。これに対し、２５０％の熱膨張係数の基板材料を用いると、１２５℃では基板が約１７５μｍの伸びとなり、シリコンウエハより１００μｍ程度伸びが大きくなる。この場合、半導体ウエハ上に形成されている半導体装置の一般的なボンディングパッドの寸法より大きくなりコンタクタがボンディングパッドよりずれ、電気的に接触不能となる。

【００２８】２２は絶縁体基板２１上に形成された信号あるいは電力を供給するためのアルミニュウム（以下、Ａｌと記す），銅（以下、Ｃｕと記す）等の導電性の薄膜で形成された信号線や電源線（以下、総称して単に配線と記す）である。２３は、信号あるいは電力を供給するための配線２２から、半導体ウエハ上の半導体装置に信号または電力を供給するために、図３に示すいわゆるスタッドバンプ３１を形成するための外部引き出し用電極である。２４は、配線２２及び外部引き出し用電極２３を保護するための保護膜であり、例えば半導体装置で通常用いられるシリコン酸化膜あるいはシリコン窒化膜等が用いられる。

【００２９】次に図３において（第２工程）、いわゆるスタッドバンプ３１が形成される。金属細線４２の材料としては、半導体装置でよく用いられる例えばＡｌ，金（以下、Ａｕと記す），Ｃｕ等が用いられ、金属細線４２の他方をほぼ垂直に引き上げた状態で切断するもので、この時の金属細線４２の高さとしては、半導体ウエハ表面の凹凸及び反り等の高さばらつきが十分に吸収できるだけの高さを有している。

【００３０】次に図４において（第３工程）、スタッドバンプ３１から伸びた金属細線４２のほぼ半分の高さまで、スタッドバンプ３１を完全に有機絶縁材料薄膜４１で被覆する。

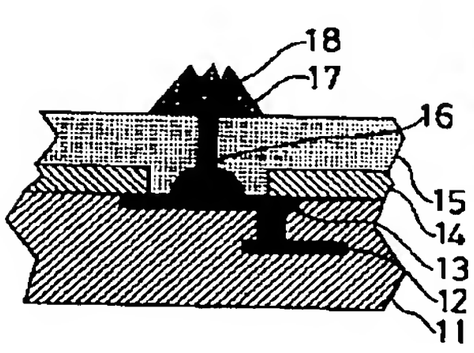
【００３１】次に図５において（第４工程）、金属細線４２の先端を金属細線４２よりも機械的硬度の高い平板に押し当て偏平形状にし、コンタクタの骨格５１を形成する。このように金属細線４２の先端を偏平にすることで、コンタクタの接触面積を拡大することができる。この場合、金属細線４２に押し当てる平板の表面をコンタクタの骨格５１の厚さ程度の凹凸になるような粗面に加工しておくことにより、通常の状態で、半導体装置のＡＬ電極の表面にある自然酸化膜をコンタクト時に突き破りやすくし、安定した電気的接触を確保することができる。ここで、コンタクタの骨格５１の形成には、上に述べたような平板を押し当てても良いし、レーザー等の様に局所加熱のできる装置によって、先端を溶融させても良い。

【００３２】最後に図６において（第５工程）、コンタクタの骨格５１の表面に、機械的に硬度の高い導電性の薄膜、例えばクロム（以下、Ｃｒと記す）をメッキ等により堆積して電極６１を形成する。スタッドバンプ３１で使用される金属細線４２の材料としては、ＡＬ，Ａｕ，等が一般的であるが、これらの材料は延性が高く、コンタクタを半導体装置電極に押し当てた際に塑性変形するため、Ｃｒの様な硬度の高い材料でコンタクタの骨格５１表面を被覆し、コンタクトの際の変形を抑制する。

【００３３】以上により、コンタクタを安価に形成することができ、半導体装置の検査費用などを含めた生産コストを低下することができるとともに、コンタクタを繰り返して使用することができる。

【００３４】ここで、特許請求の範囲に示された発明は上記実施の形態で説明した様態に限られるものではない。

【００３５】
【発明の効果】以上のように、請求項１または請求項２に記載の発明によれば、金属細線は、半導体ウエハ表面の凹凸および反り等の高さばらつきが十分に吸収できるだけの高さを持つことによって、半導体ウエハの高さばらつきを吸収し、金属細線を被覆する有機絶縁材料は、試験終了後にたわんで変形した金属細線を弾性によって復元させ、さらに金属細線の先端を粗面に変形した上で機械的硬度の高い導電材料で被覆することによって、繰り返し安定した電気的接続を可能とすることができる。
【００３６】請求項３に記載の発明によれば、被試験半導体装置とコンタクタの距離が近いときには、たわむことによって、被試験半導体電極との距離が遠いコンタクタが確実に接続されるまで、コンタクタを被試験半導体装置に押し当てて、被試験半導体装置表面の凹凸あるいは装置の反りによるコンタクト時の電気的接続を確実にすることができる。
【００３７】請求項４に記載の発明によれば、コンタクタを半導体装置チップに押し当てた際に、強く当たる電極においては、局所的に有機塗布材料が弾性変形することにより、半導体装置チップをはずした際に元の厚さに戻ることができる。
【００３８】請求項５に記載の発明によれば、半導体装置チップに押し当てた際の接触面積を広く確保することにより、電気的接続をより確実にすることができる。請求項６に記載の発明によれば、接触面積を増やすと共に、半導体装置チップ電極の表面にある自然酸化膜を突き破りやすくして、電気的接続をより確実にすることができる。
【００３９】請求項７に記載の発明によれば、コンタクタを半導体ウエハに押し当てた際のコンタクタ先端の変＊形を抑え、コンタクタを繰り返し使用できる状態に保持することができる。
【００４０】以上により、コンタクタを安価に形成することができ、半導体装置の検査費用などを含めた生産コストを低下することができるとともに、コンタクタを繰り返して使用することができる。
【図面の簡単な説明】
【図１】本発明の実施の形態の形成方法により形成されるコンタクタの断面図
【図２】同実施の形態のコンタクタの形成方法における第１工程を示す断面図
【図３】同実施の形態のコンタクタの形成方法における第２工程を示す断面図
【図４】同実施の形態のコンタクタの形成方法における第３工程を示す断面図
【図５】同実施の形態のコンタクタの形成方法における第４工程を示す断面図
【図６】同実施の形態のコンタクタの形成方法における第５工程を示す断面図
【図７】従来のコンタクタの断面図
【符号の説明】
１１，２１　絶縁体基板
１２，２２　信号線（電源線）
１３，２３　外部引き出し用電極
１４，２４　保護膜
１５，４１　有機絶縁材料薄膜
１６，３１　スタッドバンプ
１７，５１　コンタクタの骨格
１８，６１　電極
４２　金属細線

【図１】


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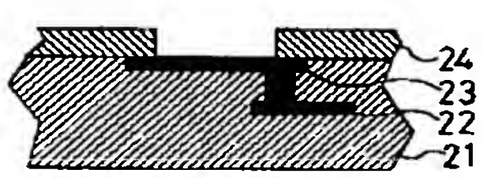

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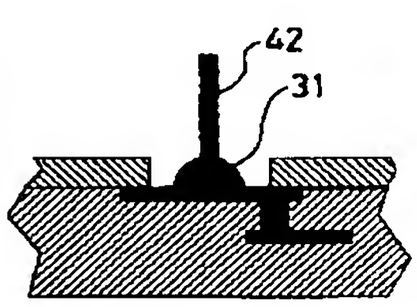

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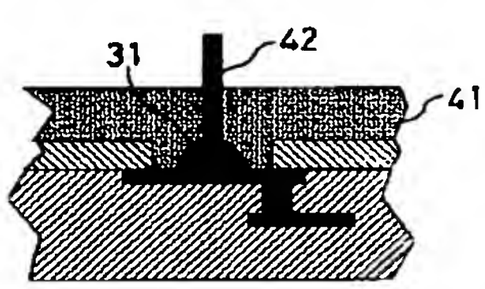

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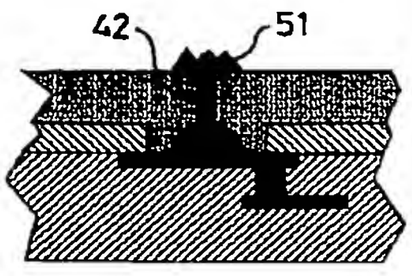

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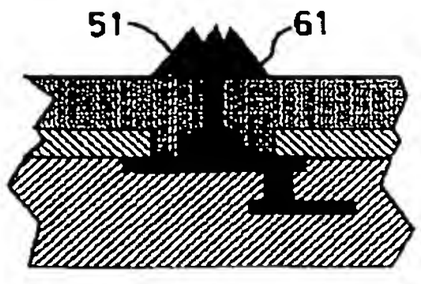

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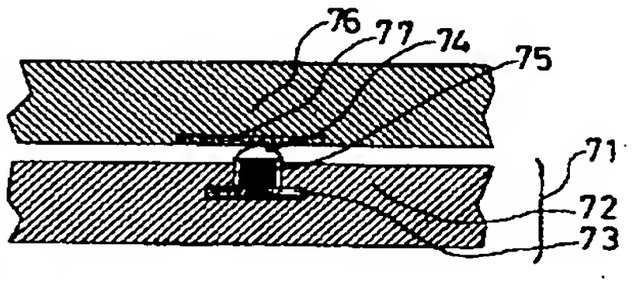

PATENT ABSTRACTS OF JAPAN

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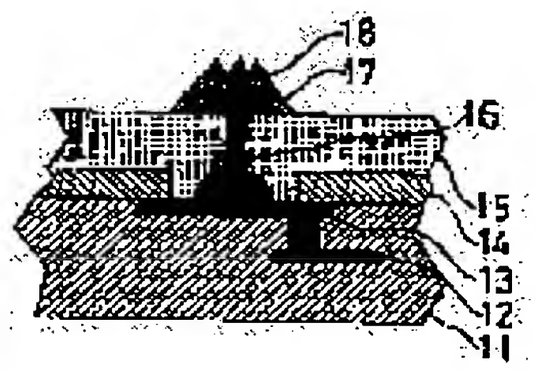
(72)Inventor : TATSUMA KENICHIRO

(54) CONTACTOR AND FORMING METHOD FOR CONTACTOR

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an inexpensive contactor capable of repeated use for burning-in in wafer state, and forming method for the contactor.
SOLUTION: On a lead pad 13 of signal cables and power wires 12 wired on an insulation base 11 having a thermal expansion coefficient close to that of silicon wafer, a stud bump 16 is formed. This stud bump 16 has metal thin wire with a height capable of absorbing variation in height such as unevenness, warp, etc., on wafer surface to be inspected. An organic insulator film 15 as a buffer member for recovering the metal thin wire to the original height after pushing it to the inspecting wafer for inspection is applied to the height that the top of the metal thin wire exposes. Then, this contactor of uncompleted state is pushed on a flat plate with harder mechanical hardness than the metal thin wire. At this moment, by giving unevenness of the grade of the film thickness of electrode material of the inspecting wafer to the flat plate surface, it makes easy to break through the natural oxide film existing on the surface of the electrode material of the inspecting wafer.



LEGAL STATUS

[Date of request for examination]

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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's

decision of rejection]
[Date of extinction of right]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] By the wire bonding which used the metal thin line for the electrode for external drawers which carried out electrical installation to said wiring, and which was prepared on the insulator substrate which has the wiring structure by which the laminating was carried out Form a stud bump, where a part for the point of said metal thin line is left, and said stud bump is covered with an organic insulating material thin film so that the amount of [of said metal thin line] point may expose. The contactor which crushed mechanically the metal thin line of the part projected from said organic insulating material thin film, and covered and constituted the part from an electrical conducting material with a high mechanical degree of hardness.
[Claim 2] By the wire bonding which used the metal thin line for the electrode for external drawers which carried out electrical installation to said wiring, and which was prepared on the insulator substrate which has the wiring structure by which the laminating was carried out Form a stud bump, where a part for the point of said metal thin line is left, and said stud bump is covered with an organic insulating material thin film so that the amount of [of said metal thin line] point may expose. The formation approach of the contactor which crushes mechanically the metal thin line of the part projected from said organic insulating material thin film, and covers the part with an electrical conducting material with a high mechanical degree of hardness.
[Claim 3] The formation approach of the contactor according to claim 2 which faces forming a stud bump in the electrode for external drawers, and makes a part for the point of the metal thin line which it left the die length of extent which can absorb the irregularity of an examined semiconductor device front face.
[Claim 4] The formation approach of the contactor according to claim 3 which covers with an organic insulating material for the point [a part of] of the metal thin line which it left when forming a stud bump in the electrode for external drawers.
[Claim 5] The formation approach of the contactor according to claim 4 which presses monotonously and is processed flatly which has a level field for the point projected from the covering part by the organic insulating material of the metal thin line which it left when forming a stud bump in the electrode for external drawers.
[Claim 6] The formation approach of the contactor according to claim 5 which was processed on the split face when pressing down the point of a metal thin line and which presses monotonously and carries out surface roughening of the front face of a flat processing part.
[Claim 7] The formation approach of the contactor according to claim 5 which covers the front face of a flat processing part with an electrical conducting material with a high mechanical degree of hardness.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the formation approach of the contactor for inspecting two or more semiconductor integrated circuit chips on a wafer collectively, and a contactor.
[0002]
[Description of the Prior Art] In recent years, as for the advance of the miniaturization in the electronic equipment carrying semiconductor integrated circuit equipment (a semiconductor device is called hereafter.), **** better ** and low-pricing are also progressing. In connection with this, the demand of a miniaturization and low-pricing is strong also to the semiconductor device.
[0003] Usually, a semiconductor device cuts down at a time to one two or more semiconductor device chips formed on the semi-conductor wafer, after pasting the die pad of a leadframe, respectively, it connects each semiconductor device chip with a leadframe electrically by the bonding wire, where a semiconductor device chip and a leadframe are closed with resin or the ceramics after that, it is supplied, and it is mounted in a printed circuit board.
[0004] However, in order for closure ingredients, such as resin and ceramics, not to be the objects which carry out a direct action to an electrical circuit property and to attain a miniaturization and lightweight-izing of electronic equipment further recently With the gestalt of the semiconductor device chip in the condition that the closure is not carried out as a semiconductor device carried in the electronic equipment, starting from a semi-conductor wafer In the semiconductor device chip mounted in the circuit board by developing the approach of mounting directly and doing in this way, it is a requirement that the quality is guaranteed enough.

[0005] Thus, although there is the approach of mounting each semiconductor device chip in the condition of having started from the semi-conductor wafer in the energization substrate for reliability assurances using the socket for a chip, and carrying out a burn in test in that condition in order to guarantee the quality of a semiconductor device chip, by this approach, the socket for a chip is expensive, the handling of a semiconductor device chip is complicated again, and time amount cuts in many. For this reason, the approach of bundling up two or more semiconductor device chips in the state of that wafer, and carrying out a burn in test is developed.
[0006] In order to put in block two or more semiconductor device chips in the state of a wafer and to inspect a burn in test etc., to two or more semiconductor device chips of all formed on one semi-conductor wafer, a probe needle is stood and electric connection is taken, and it is necessary to impress supply voltage and a signal to coincidence and to operate it. For this reason, a probe card with very many probe needles will be needed, and a price will also become expensive.
[0007] Then, the contactor which consists of a probe card of the thin film mold with which the bump was prepared in the flexible substrate is proposed (refer to 57th page - 62 pages of volume [of Japanese east technique / 28th] No. 2 (October, 1990)).

[0008] The burn in test using such a contactor is explained below. Drawing 7 is the sectional view showing the condition of probing using the conventional contactor. In drawing 7 , 71 is the contactor of a card mold and has the through hole wiring 75 which connects between the wiring layer 73 formed on the polyimide substrate 72 and the polyimide substrate 72 and the bump electrode 74 as a probe terminal and a wiring layer 73, and the bump electrode 74.
[0009] As shown in drawing 7 , a contactor 71 is forced on the semi-conductor wafer 76 which is a measurement board-ed, the pad electrode 77 as a checking electrode on the semi-conductor wafer 76 and the bump electrode 74 of a contactor 71 are stuck by pressure, and it connects electrically. By impressing supply voltage and a signal to the bump electrode 74 through a wiring layer 73 in this condition, inspection of the semiconductor device chip on the semi-conductor wafer 76 is attained.
[0010]
[Problem(s) to be Solved by the Invention] however, in the above conventional contactors When the pressure welding of the contactor is carried out to a semi-conductor wafer and it connects, a semi-conductor wafer front face since it is not completely flat Unless it presses strongly until it makes the polyimide substrate which constitutes a contactor deform, probing cannot be certainly carried out to the electrodes of all the semiconductor devices on a wafer. Such a contactor It deteriorated quickly and had the trouble that it could not be repeatedly used over a long period of time.
[0011] Moreover, in the contactor using such a polyimide substrate, it became expensive also in cost, the production cost including the inspection fee of a semiconductor device etc. was raised, and it also had the trouble of leading also to a price hike of the electronic equipment which carried them.
[0012] This invention can solve the above-mentioned conventional trouble, and can form it cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., the formation approach of of the contactor and contactor which can be used repeatedly is offered.
[0013]
[Means for Solving the Problem] in order to solve the above-mentioned technical problem , it be characterize by absorb dispersion in the height by the irregularity of a semi-conductor wafer front face etc. according to the flexibility of an organic spreading ingredient , the formation approach of the contactor of this invention and a contactor raise the mechanical strength of a stud bump metal thin line part while enable use of the stud bump who used the wire bonding technique in_which of a track record be very high , in a semiconductor industry .
[0014] By the above, a contactor can be formed cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., a contactor can be repeated and used.
[0015]
[Embodiment of the Invention] The contactor of this invention according to claim 1 by the wire bonding which used the metal thin line for the electrode for external drawers which carried out electrical installation to said wiring, and which was prepared on the insulator substrate which has the wiring structure by which the laminating was carried out Form a stud bump, where a part for the point of said metal thin line is left, and said stud bump is covered with an organic insulating material thin film so that the amount of [of said metal thin line] point may expose. The metal thin line of the part projected from said organic insulating material thin film is crushed mechanically, and the part covers and consists of electrical conducting materials with a high mechanical degree of hardness.
[0016] The formation approach of a contactor according to claim 2 by the wire bonding which used the metal thin line for the electrode for external drawers which carried out electrical installation to said wiring, and which was prepared on the insulator substrate which has the wiring structure by which the laminating was carried out Form a stud bump, where a part for the point of said metal thin line is left, and said stud bump is covered with an organic insulating material thin film so that the amount of [of said metal thin line] point may expose. The metal thin line of the part projected from said organic insulating material thin film is crushed

mechanically, and it considers as the approach of covering the part with an electrical conducting material with a high mechanical degree of hardness.
[0017] According to these configurations or approaches, a metal thin line When height dispersion, such as irregularity of a semi-conductor wafer front face and curvature, has only fully absorbable height The organic insulating material which absorbs height dispersion of a semi-conductor wafer and covers a metal thin line Electrical installation stabilized repeatedly is made possible by covering with an electrical conducting material with a high mechanical degree of hardness, after restoring with elasticity the metal thin line which bent and deformed after test termination and deforming the tip of a metal thin line into a split face further.
[0018] In the formation approach of a contactor according to claim 2, the formation approach of a contactor according to claim 3 is faced forming a stud bump in the electrode for external drawers, and makes a part for the point of the metal thin line which it left the approach of making it into the die length of extent which can absorb the irregularity of an examined semiconductor device front face.
[0019] According to this approach, when the distance of an examined semiconductor device and a contactor is near, a contactor is pressed against an examined semiconductor device and electrical installation at the time of contact by the irregularity of an examined semiconductor device front face or the curvature of equipment is ensured until a contactor with a far distance with an examined semiconductor electrode is certainly connected by bending.
[0020] The formation approach of a contactor according to claim 4 makes it the approach of covering with an organic insulating material in the formation approach of a contactor according to claim 3 for the point [a part of] of the metal thin line which it left when forming a stud bump in the electrode for external drawers.
[0021] According to this approach, when a contactor is pressed against a semiconductor device chip, an organic spreading ingredient carries out elastic deformation locally in the electrode which hits strongly, and a semiconductor device chip is removed, it returns to the original thickness.
[0022] The formation approach of a contactor according to claim 5 makes the point projected from the covering part by the organic insulating material of the metal thin line which it left when forming a stud bump in the electrode for external drawers the approach with a level field of pressing monotonously and processing it flatly in the formation approach of a contactor according to claim 4.
[0023] According to this approach, electrical installation is made more reliable by securing widely the touch area at the time of pressing against a semiconductor device chip. In the formation approach of a contactor according to claim 5, in case the formation approach of a contactor according to claim 6 presses down the point of a metal thin line, it presses monotonously and let it be the approach of carrying out surface roughening of the front face of a flat processing part by which it was processed on the split face.
[0024] According to this approach, while increasing a touch area, the natural oxidation film in the front face of a semiconductor device chip electrode is made easy to break through, and electrical installation is made more reliable. Let the formation approach of a contactor according to claim 7 be the approach of covering the front face of a flat processing part with an electrical conducting material with a high mechanical degree of hardness in the formation approach of a contactor according to claim 5.
[0025] According to this approach, deformation of the contactor tip at the time of pressing a contactor against a semi-conductor wafer is suppressed, and it holds in the condition that a contactor can be repeated and used. Hereafter, the formation approach of of the contactor and contactor which show the gestalt of operation of this invention is explained concretely, referring to a drawing.
[0026] Drawing 1 is the sectional view showing the structure of the contactor formed by the formation approach of the gestalt this operation. The insulator substrate with which a signal line and a power-source line for 11 to supply an electrical signal and power to the semiconductor device used as the contactor exterior and a tested piece in drawing 1 are installed, The signal line currently installed in order that 12 may supply an electrical signal and power to the

semiconductor device used as the contactor exterior and a trial-ed, and a power-source line, A protective coat for the electrode for external drawers which prepared 13 on the insulator substrate 11, and 14 to protect the front face of the insulator substrate 11, The so-called stud bump by whom 16 was formed on the electrode 13 for external drawers, The organic insulating material thin film for absorbing the deformation of the stud bump 16 caused by the irregularity of a semi-conductor wafer etc. when 15 presses a contactor against a semi-conductor wafer, and 17 Or it is processed flatly thermally. mechanical in the part projected from the organic insulating material thin film 15 of the metal thin line extended from the stud bump 16 -- The frame of the contactor which made the split face to the front face, and 18 are the electrodes mechanically formed in the frame 17 of the contactor formed from the metal thin line with the electrical conducting material with a hard degree of hardness.

[0027] The formation approach of the contactor constituted as mentioned above is explained below, referring to drawing 6 from drawing 2 . In drawing 2 (the 1st process), the ingredient which has the coefficient of thermal expansion of 250% or less of range to the coefficient of thermal expansion (3.5x10-6/degree C) of a silicon wafer [like silica glass] whose insulator substrate 21 is is used. When carrying out a burn-in at 125 degrees C is assumed, in a 8 inches silicon wafer, about 70-micrometer elongation produces this. On the other hand, if the substrate ingredient of 250% of coefficient of thermal expansion is used, at 125 degrees C, a substrate will serve as about 175-micrometer elongation, and about 100 micrometers of elongation will become large from a silicon wafer. In this case, it becomes large, and a contactor shifts from a bonding pad and serves as contact impossible from the dimension of the common bonding pad of the semiconductor device currently formed on the semi-conductor wafer electrically.

[0028] 22 is the signal line and power-source line (hereafter, it names generically and is only described as wiring) which were formed with conductive thin films, such as aluminum (it is hereafter described as aluminum) for supplying the signal or power formed on the insulator substrate 21, and copper (it is hereafter described as Cu). 23 is an electrode for external drawers for forming the so-called stud bump 31 who shows drawing 3 , in order to supply a signal or power to the semiconductor device on a semi-conductor wafer from the wiring 22 for supplying a signal or power. Silicon oxide or a silicon nitride etc. which 24 is a protective coat for protecting wiring 22 and the electrode 23 for external drawers, for example, is usually used with a semiconductor device is used.

[0029] Next, the so-called stud bump 31 is formed in drawing 3 (the 2nd process). As an ingredient of the metal thin line 42, a semiconductor device may be used, and aluminum, gold (it is hereafter described as Au), Cu, etc. are used, for example, and it cuts in the condition which pulled up another side of the metal thin line 42 almost perpendicularly of being used, and has only the height which height dispersion, such as irregularity of a semi-conductor wafer front face and curvature, can fully absorb as height of the metal thin line 42 at this time.

[0030] next, the metal thin line 42 extended from the stud bump 31 in drawing 4 (the 3rd process) -- the stud bump 31 is mostly covered with the organic insulating material thin film 41 completely to half height.

[0031] Next, in drawing 5 (the 4th process), the tip of the metal thin line 42 is pressed against a plate with a mechanical degree of hardness higher than the metal thin line 42, it is made a flat configuration, and the frame 51 of a contactor is formed. Thus, by making the tip of the metal thin line 42 flat, the touch area of a contactor is expandable. In this case, the electric contact which made the natural oxidation film in the front face of AL electrode of a semiconductor device easy to break through in the usual condition at the time of contact, and was stabilized is securable by processing the monotonous front face pressed against the metal thin line 42 on a split face which becomes the irregularity of thickness extent of the frame 51 of a contactor. Here, a plate which was described above may be pressed against formation of the frame 51 of a contactor, and melting of the tip may be carried out to it with the equipment which can perform partial heating like laser.

[0032] Finally, in drawing 6 (the 5th process), a conductive thin film with a high degree of hardness, for example, chromium, (it is hereafter described as Cr) is mechanically deposited on the front face of the frame 51 of a contactor by plating etc., and an electrode 61 is formed in it.

As an ingredient of the metal thin line 42 used by the stud bump 31, although AL, Au, etc. are common, these ingredients have high ductility, when a contactor is pressed against a semiconductor device electrode, in order to deform plastically, cover frame 51 front face of a contactor with an ingredient with a high degree of hardness like Cr, and control the deformation in the case of contact.

[0033] By the above, a contactor can be formed cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., a contactor can be repeated and used.

[0034] Here, invention shown in the claim is not restricted to the aspect explained with the gestalt of the above-mentioned implementation.

[0035]

[Effect of the Invention] According to invention according to claim 1 or 2, as mentioned above, a metal thin line When height dispersion, such as irregularity of a semi-conductor wafer front face and curvature, has only fully absorbable height The organic insulating material which absorbs height dispersion of a semi-conductor wafer and covers a metal thin line Electrical installation stabilized repeatedly can be made possible by covering with an electrical conducting material with a high mechanical degree of hardness, after restoring with elasticity the metal thin line which bent and deformed after test termination and deforming the tip of a metal thin line into a split face further.

[0036] According to invention according to claim 3, when the distance of an examined semiconductor device and a contactor is near, a contactor can be pressed against an examined semiconductor device and electrical installation at the time of contact by the irregularity of an examined semiconductor device front face or the curvature of equipment can be ensured until a contactor with a far distance with an examined semiconductor electrode is certainly connected by bending.

[0037] According to invention according to claim 4, when a contactor is pressed against a semiconductor device chip, an organic spreading ingredient carries out elastic deformation locally in the electrode which hits strongly, and a semiconductor device chip is removed, it can return to the original thickness.

[0038] According to invention according to claim 5, electrical installation can be made more reliable by securing widely the touch area at the time of pressing against a semiconductor device chip. According to invention according to claim 6, while increasing a touch area, the natural oxidation film in the front face of a semiconductor device chip electrode can be made easy to break through, and electrical installation can be made more reliable.

[0039] According to invention according to claim 7, deformation of the contactor tip at the time of pressing a contactor against a semi-conductor wafer can be suppressed, and it can hold in the condition that a contactor can be repeated and used.

[0040] By the above, a contactor can be formed cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., a contactor can be repeated and used.

[Translation done.]

* NOTICES *

TECHNICAL FIELD

[Field of the Invention] This invention relates to the formation approach of the contactor for inspecting two or more semiconductor integrated circuit chips on a wafer collectively, and a contactor.

[Translation done.]

PRIOR ART

[Description of the Prior Art] In recent years, as for the advance of the miniaturization in the electronic equipment carrying semiconductor integrated circuit equipment (a semiconductor device is called hereafter.), **** better ** and low-pricing are also progressing. In connection with this, the demand of a miniaturization and low-pricing is strong also to the semiconductor device.
[0003] Usually, a semiconductor device cuts down at a time to one two or more semiconductor device chips formed on the semi-conductor wafer, after pasting the die pad of a leadframe, respectively, it connects each semiconductor device chip with a leadframe electrically by the bonding wire, where a semiconductor device chip and a leadframe are closed with resin or the ceramics after that, it is supplied, and it is mounted in a printed circuit board.
[0004] However, in order for closure ingredients, such as resin and ceramics, not to be the objects which carry out a direct action to an electrical circuit property and to attain a miniaturization and lightweight-izing of electronic equipment further recently With the gestalt of the semiconductor device chip in the condition that the closure is not carried out as a semiconductor device carried in the electronic equipment, starting from a semi-conductor wafer In the semiconductor device chip mounted in the circuit board by developing the approach of mounting directly and doing in this way, it is a requirement that the quality is guaranteed enough.

[0005] Thus, although there is the approach of mounting each semiconductor device chip in the condition of having started from the semi-conductor wafer in the energization substrate for reliability assurances using the socket for a chip, and carrying out a burn in test in that condition in order to guarantee the quality of a semiconductor device chip, by this approach, the socket for a chip is expensive, the handling of a semiconductor device chip is complicated again, and time amount cuts in many. For this reason, the approach of bundling up two or more semiconductor device chips in the state of that wafer, and carrying out a burn in test is developed.
[0006] In order to put in block two or more semiconductor device chips in the state of a wafer and to inspect a burn in test etc., to two or more semiconductor device chips of all formed on one semi-conductor wafer, a probe needle is stood and electric connection is taken, and it is necessary to impress supply voltage and a signal to coincidence and to operate it. For this reason, a probe card with very many probe needles will be needed, and a price will also become expensive.
[0007] Then, the contactor which consists of a probe card of the thin film mold with which the bump was prepared in the flexible substrate is proposed (refer to 57th page - 62 pages of volume [of Japanese east technique / 28th] No. 2 (October, 1990)).
[0008] The burn in test using such a contactor is explained below. Drawing 7 is the sectional view showing the condition of probing using the conventional contactor. In drawing 7 , 71 is the contactor of a card mold and has the through hole wiring 75 which connects between the wiring layer 73 formed on the polyimide substrate 72 and the polyimide substrate 72 and the bump electrode 74 as a probe terminal and a wiring layer 73, and the bump electrode 74.
[0009] As shown in drawing 7 , a contactor 71 is forced on the semi-conductor wafer 76 which is

a measurement board-ed, the pad electrode 77 as a checking electrode on the semi-conductor wafer 76 and the bump electrode 74 of a contactor 71 are stuck by pressure, and it connects electrically. By impressing supply voltage and a signal to the bump electrode 74 through a wiring layer 73 in this condition, inspection of the semiconductor device chip on the semi-conductor wafer 76 is attained.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to invention according to claim 1 or 2, as mentioned above, a metal thin line When height dispersion, such as irregularity of a semi-conductor wafer front face and curvature, has only fully absorbable height The organic insulating material which absorbs height dispersion of a semi-conductor wafer and covers a metal thin line Electrical installation stabilized repeatedly can be made possible by covering with an electrical conducting material with a high mechanical degree of hardness, after restoring with elasticity the metal thin line which bent and deformed after test termination and deforming the tip of a metal thin line into a split face further.
[0036] According to invention according to claim 3, when the distance of an examined semiconductor device and a contactor is near, a contactor can be pressed against an examined semiconductor device and electrical installation at the time of contact by the irregularity of an examined semiconductor device front face or the curvature of equipment can be ensured until a contactor with a far distance with an examined semiconductor electrode is certainly connected by bending.
[0037] According to invention according to claim 4, when a contactor is pressed against a semiconductor device chip, an organic spreading ingredient carries out elastic deformation locally in the electrode which hits strongly, and a semiconductor device chip is removed, it can return to the original thickness.
[0038] According to invention according to claim 5, electrical installation can be made more reliable by securing widely the touch area at the time of pressing against a semiconductor device chip. According to invention according to claim 6, while increasing a touch area, the natural oxidation film in the front face of a semiconductor device chip electrode can be made easy to break through, and electrical installation can be made more reliable.
[0039] According to invention according to claim 7, deformation of the contactor tip at the time of pressing a contactor against a semi-conductor wafer can be suppressed, and it can hold in the condition that a contactor can be repeated and used.
[0040] By the above, a contactor can be formed cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., a contactor can be repeated and used.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, in the above conventional contactors When the pressure welding of the contactor is carried out to a semi-conductor wafer and it connects, a semi-conductor wafer front face since it is not completely flat Unless it presses strongly until it makes the polyimide substrate which constitutes a contactor deform, probing cannot be certainly carried out to the electrodes of all the semiconductor devices on a wafer. Such a contactor It deteriorated quickly and had the trouble that it could not be repeatedly used over a long period of time.

[0011] Moreover, in the contactor using such a polyimide substrate, it became expensive also in cost, the production cost including the inspection fee of a semiconductor device etc. was raised, and it also had the trouble of leading also to a price hike of the electronic equipment which carried them.

[0012] This invention can solve the above-mentioned conventional trouble, and can form it cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., the formation approach of of the contactor and contactor which can be used repeatedly is offered.

[Translation done.]

MEANS

[Means for Solving the Problem] in order to solve the above-mentioned technical problem , it be characterize by absorb dispersion in the height by the irregularity of a semi-conductor wafer front face etc. according to the flexibility of an organic spreading ingredient , the formation approach of the contactor of this invention and a contactor raise the mechanical strength of a stud bump metal thin line part while enable use of the stud bump who used the wire bonding technique in_which of a track record be very high , in a semiconductor industry .
[0014] By the above, a contactor can be formed cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., a contactor can be repeated and used.
[0015]
[Embodiment of the Invention] The contactor of this invention according to claim 1 by the wire bonding which used the metal thin line for the electrode for external drawers which carried out electrical installation to said wiring, and which was prepared on the insulator substrate which has the wiring structure by which the laminating was carried out Form a stud bump, where a part for the point of said metal thin line is left, and said stud bump is covered with an organic insulating material thin film so that the amount of [of said metal thin line] point may expose. The metal thin line of the part projected from said organic insulating material thin film is crushed mechanically, and the part covers and consists of electrical conducting materials with a high mechanical degree of hardness.
[0016] The formation approach of a contactor according to claim 2 by the wire bonding which used the metal thin line for the electrode for external drawers which carried out electrical installation to said wiring, and which was prepared on the insulator substrate which has the wiring structure by which the laminating was carried out Form a stud bump, where a part for the point of said metal thin line is left, and said stud bump is covered with an organic insulating material thin film so that the amount of [of said metal thin line] point may expose. The metal thin line of the part projected from said organic insulating material thin film is crushed mechanically, and it considers as the approach of covering the part with an electrical conducting material with a high mechanical degree of hardness.
[0017] According to these configurations or approaches, a metal thin line When height dispersion, such as irregularity of a semi-conductor wafer front face and curvature, has only fully absorbable height The organic insulating material which absorbs height dispersion of a semi-conductor wafer and covers a metal thin line Electrical installation stabilized repeatedly is made possible by covering with an electrical conducting material with a high mechanical degree of hardness, after restoring with elasticity the metal thin line which bent and deformed after test termination and deforming the tip of a metal thin line into a split face further.
[0018] In the formation approach of a contactor according to claim 2, the formation approach of a contactor according to claim 3 is faced forming a stud bump in the electrode for external drawers, and makes a part for the point of the metal thin line which it left the approach of making it into the die length of extent which can absorb the irregularity of an examined semiconductor device front face.
[0019] According to this approach, when the distance of an examined semiconductor device and

a contactor is near, a contactor is pressed against an examined semiconductor device and electrical installation at the time of contact by the irregularity of an examined semiconductor device front face or the curvature of equipment is ensured until a contactor with a far distance with an examined semiconductor electrode is certainly connected by bending.
[0020] The formation approach of a contactor according to claim 4 makes it the approach of covering with an organic insulating material in the formation approach of a contactor according to claim 3 for the point [a part of] of the metal thin line which it left when forming a stud bump in the electrode for external drawers.
[0021] According to this approach, when a contactor is pressed against a semiconductor device chip, an organic spreading ingredient carries out elastic deformation locally in the electrode which hits strongly, and a semiconductor device chip is removed, it returns to the original thickness.
[0022] The formation approach of a contactor according to claim 5 makes the point projected from the covering part by the organic insulating material of the metal thin line which it left when forming a stud bump in the electrode for external drawers the approach with a level field of pressing monotonously and processing it flatly in the formation approach of a contactor according to claim 4.
[0023] According to this approach, electrical installation is made more reliable by securing widely the touch area at the time of pressing against a semiconductor device chip. In the formation approach of a contactor according to claim 5, in case the formation approach of a contactor according to claim 6 presses down the point of a metal thin line, it presses monotonously and let it be the approach of carrying out surface roughening of the front face of a flat processing part by which it was processed on the split face.
[0024] According to this approach, while increasing a touch area, the natural oxidation film in the front face of a semiconductor device chip electrode is made easy to break through, and electrical installation is made more reliable. Let the formation approach of a contactor according to claim 7 be the approach of covering the front face of a flat processing part with an electrical conducting material with a high mechanical degree of hardness in the formation approach of a contactor according to claim 5.
[0025] According to this approach, deformation of the contactor tip at the time of pressing a contactor against a semi-conductor wafer is suppressed, and it holds in the condition that a contactor can be repeated and used. Hereafter, the formation approach of of the contactor and contactor which show the gestalt of operation of this invention is explained concretely, referring to a drawing.
[0026] Drawing 1 is the sectional view showing the structure of the contactor formed by the formation approach of the gestalt this operation. The insulator substrate with which a signal line and a power-source line for 11 to supply an electrical signal and power to the semiconductor device used as the contactor exterior and a tested piece in drawing 1 are installed, The signal line currently installed in order that 12 may supply an electrical signal and power to the semiconductor device used as the contactor exterior and a trial-ed, and a power-source line, A protective coat for the electrode for external drawers which prepared 13 on the insulator substrate 11, and 14 to protect the front face of the insulator substrate 11, The so-called stud bump by whom 16 was formed on the electrode 13 for external drawers, The organic insulating material thin film for absorbing the deformation of the stud bump 16 caused by the irregularity of a semi-conductor wafer etc. when 15 presses a contactor against a semi-conductor wafer, and 17 Or it is processed flatly thermally. mechanical in the part projected from the organic insulating material thin film 15 of the metal thin line extended from the stud bump 16 -- The frame of the contactor which made the split face to the front face, and 18 are the electrodes mechanically formed in the frame 17 of the contactor formed from the metal thin line with the electrical conducting material with a hard degree of hardness.
[0027] The formation approach of the contactor constituted as mentioned above is explained below, referring to drawing 6 from drawing 2 . In drawing 2 (the 1st process), the ingredient which has the coefficient of thermal expansion of 250% or less of range to the coefficient of thermal expansion (3.5x10-6/degree C) of a silicon wafer [like silica glass] whose insulator substrate 21

is is used. When carrying out a burn-in at 125 degrees C is assumed, in a 8 inches silicon wafer, about 70-micrometer elongation produces this. On the other hand, if the substrate ingredient of 250% of coefficient of thermal expansion is used, at 125 degrees C, a substrate will serve as about 175-micrometer elongation, and about 100 micrometers of elongation will become large from a silicon wafer. In this case, it becomes large, and a contactor shifts from a bonding pad and serves as contact impossible from the dimension of the common bonding pad of the semiconductor device currently formed on the semi-conductor wafer electrically.
[0028] 22 is the signal line and power-source line (hereafter, it names generically and is only described as wiring) which were formed with conductive thin films, such as aluminum (it is hereafter described as aluminum) for supplying the signal or power formed on the insulator substrate 21, and copper (it is hereafter described as Cu). 23 is an electrode for external drawers for forming the so-called stud bump 31 who shows drawing 3 , in order to supply a signal or power to the semiconductor device on a semi-conductor wafer from the wiring 22 for supplying a signal or power. Silicon oxide or a silicon nitride etc. which 24 is a protective coat for protecting wiring 22 and the electrode 23 for external drawers, for example, is usually used with a semiconductor device is used.
[0029] Next, the so-called stud bump 31 is formed in drawing 3 (the 2nd process). As an ingredient of the metal thin line 42, a semiconductor device may be used, and aluminum, gold (it is hereafter described as Au), Cu, etc. are used, for example, and it cuts in the condition which pulled up another side of the metal thin line 42 almost perpendicularly of being used, and has only the height which height dispersion, such as irregularity of a semi-conductor wafer front face and curvature, can fully absorb as height of the metal thin line 42 at this time.
[0030] next, the metal thin line 42 extended from the stud bump 31 in drawing 4 (the 3rd process) -- the stud bump 31 is mostly covered with the organic insulating material thin film 41 completely to half height.
[0031] Next, in drawing 5 (the 4th process), the tip of the metal thin line 42 is pressed against a plate with a mechanical degree of hardness higher than the metal thin line 42, it is made a flat configuration, and the frame 51 of a contactor is formed. Thus, by making the tip of the metal thin line 42 flat, the touch area of a contactor is expandable. In this case, the electric contact which made the natural oxidation film in the front face of AL electrode of a semiconductor device easy to break through in the usual condition at the time of contact, and was stabilized is securable by processing the monotonous front face pressed against the metal thin line 42 on a split face which becomes the irregularity of thickness extent of the frame 51 of a contactor. Here, a plate which was described above may be pressed against formation of the frame 51 of a contactor, and melting of the tip may be carried out to it with the equipment which can perform partial heating like laser.
[0032] Finally, in drawing 6 (the 5th process), a conductive thin film with a high degree of hardness, for example, chromium, (it is hereafter described as Cr) is mechanically deposited on the front face of the frame 51 of a contactor by plating etc., and an electrode 61 is formed in it. As an ingredient of the metal thin line 42 used by the stud bump 31, although AL, Au, etc. are common, these ingredients have high ductility, when a contactor is pressed against a semiconductor device electrode, in order to deform plastically, cover frame 51 front face of a contactor with an ingredient with a high degree of hardness like Cr, and control the deformation in the case of contact.
[0033] By the above, a contactor can be formed cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., a contactor can be repeated and used.
[0034] Here, invention shown in the claim is not restricted to the aspect explained with the gestalt of the above-mentioned implementation.

[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, in the above conventional contactors When the pressure welding of the contactor is carried out to a semi-conductor wafer and it connects, a semi-conductor wafer front face since it is not completely flat Unless it presses strongly until it makes the polyimide substrate which constitutes a contactor deform, probing cannot be certainly carried out to the electrodes of all the semiconductor devices on a wafer. Such a contactor It deteriorated quickly and had the trouble that it could not be repeatedly used over a long period of time.

[0011] Moreover, in the contactor using such a polyimide substrate, it became expensive also in cost, the production cost including the inspection fee of a semiconductor device etc. was raised, and it also had the trouble of leading also to a price hike of the electronic equipment which carried them.

[0012] This invention can solve the above-mentioned conventional trouble, and can form it cheaply, and while being able to fall a production cost including the inspection fee of a semiconductor device etc., the formation approach of of the contactor and contactor which can be used repeatedly is offered.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

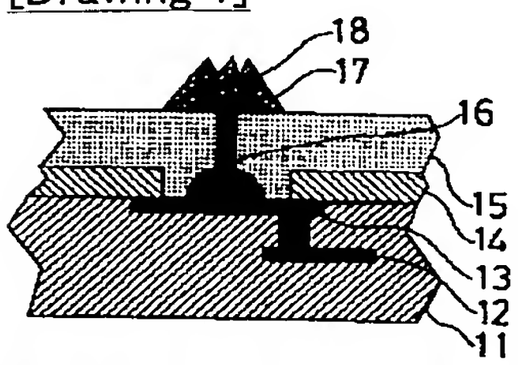
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of the contactor formed by the formation approach of the gestalt operation of this invention
[Drawing 2] The sectional view showing the 1st process in the formation approach of the contactor of the gestalt this operation
[Drawing 3] The sectional view showing the 2nd process in the formation approach of the contactor of the gestalt this operation
[Drawing 4] The sectional view showing the 3rd process in the formation approach of the contactor of the gestalt this operation
[Drawing 5] The sectional view showing the 4th process in the formation approach of the contactor of the gestalt this operation
[Drawing 6] The sectional view showing the 5th process in the formation approach of the contactor of the gestalt this operation
[Drawing 7] The sectional view of the conventional contactor
[Description of Notations]
11 21 Insulator substrate
12 22 Signal line (power-source line)
13 23 Electrode for external drawers
14 24 Protective coat
15 41 Organic insulating material thin film
16 31 Stud bump
17 51 Frame of a contactor
18 61 Electrode
42 Metal Thin Line

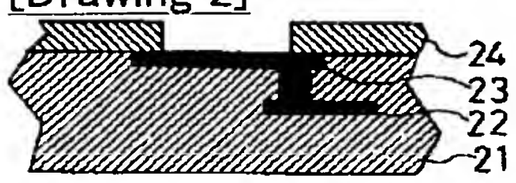
[Translation done.]

DRAWINGS

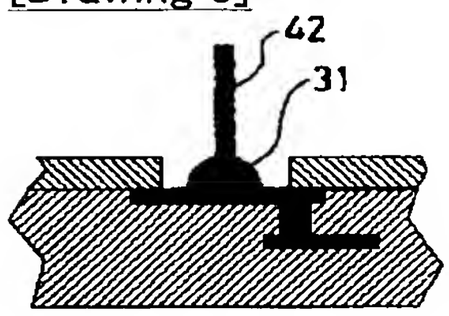
[Drawing 1]



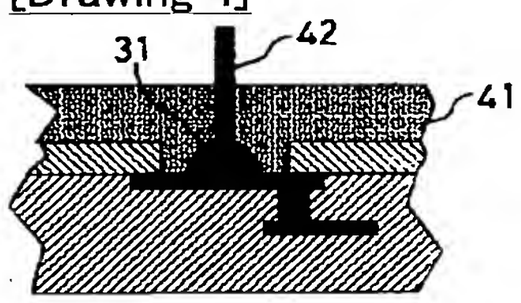
[Drawing 2]



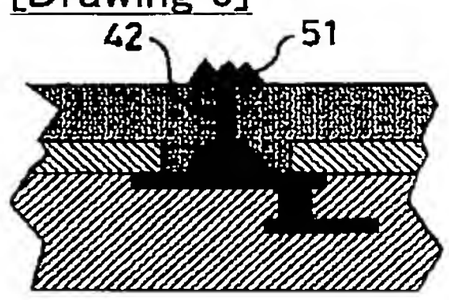
[Drawing 3]



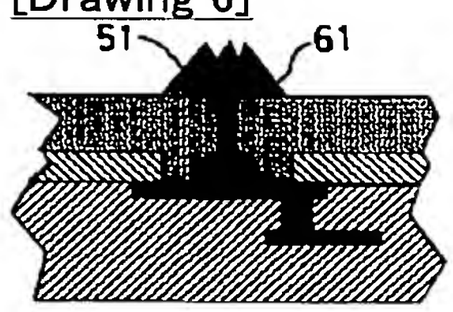
[Drawing 4]



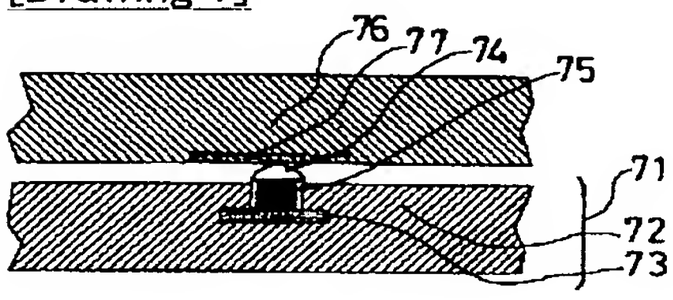
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]